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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,211	01/23/2002	Joseph A. Yedinak	90065.022702	5042

7590 08/05/2003

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EXAMINER	
LANDAU, MATTHEW C	
ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 08/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/055,211	YEDINAK ET AL.	
	Examiner	Art Unit	
	Matthew Landau	2815	

-- The MAILING DATE of this communication appears on the cover she t with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10,12-20,22-35,37,38,39, and 42* is/are pending in the application.

4a) Of the above claim(s) *3,6,7,9,24,33 and 39* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,5,8,13-20,22,23,26-31,35,37 and 38* is/are rejected.

7)☒ Claim(s) *10,12,25,32,34 and 42* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 May 2002* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *14 May 2003* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the following features must be shown or the feature(s) canceled from the claim(s): the source segments having different lengths, and the doping concentration in the source stripes being different from the doping concentration in the source contact regions, and an insulating layer entirely covering the source stripes (claim 35) (the drawings to not show one insulating layer covering both source stripes). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on May 14, 2003 have been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Objections

Claims 1, 5, 17, 20, and 30 are objected to because of the following informalities:

In regard to claim 1, the limitations "each base region" and "each base stripe" are objected to. These limitations should be change to the "at least one" language, since it is possible to have only one base region. Also, it is unclear what "the insulating layer" refers to, since more than one insulating layer is define. Claim 20 has similar problems.

In regards to claim 5, there is insufficient antecedent basis for "the base stripes".

In regards to claim 17, the limitation "source stripes is the less than" should be changed to "source stripes is [the] less than".

Further regarding claim 20, there is insufficient antecedent basis for said body stripe.

Claim 30 is objected to for a being a substantial duplicate of claim 28.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 15, 17, 18, 20, and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Bhalla et al. (US Pat. 6,437,419, hereinafter Bhalla).

In regards to claim 1, Figure 1a of Bhalla discloses a substrate 8 heavily doped with a first dopant of one polarity; buffer 6 and drift 12 layers doped with a second dopant of a polarity opposite to the first dopant, the buffer and drift layers located over the substrate, with the drift layer extending to a first surface, said first surface being opposite the substrate; a base region 30 doped with the first dopant, the base region bordered by the drift layer, and the base region extending along said first surface to form a corresponding base stripe on said first surface; first and second source stripes 20 doped with the second dopant and located in the base stripe, said source stripes being spaced apart from and substantially parallel relative to each other, said source stripes extending in a substantially parallel manner relative to the base stripe; a body stripe 33 defined between said source stripes; first and second channel regions 36, each of said channel regions extending across said base stripe from a corresponding one of said source strips to said drift layer in a direction away from said body stripe; a respective gate oxide stripe 14 over each channel region; a respective conductive gate stripe 16 on each gate oxide stripe for controlling current through the corresponding channel; a respective insulating layer 18 over each conductive gate stripe, each insulating layer entirely covering a corresponding one of the source stripes; a source contact layer (see Figure 10) extending through the insulating layer at a location between the conductive gate stripes; and a plurality of source contact regions 40 (column 2, line 10 teaches more than one contact region) heavily doped with the second dopant, disposed in the body stripe and extending from the body stripe to at least one of the source stripes and in electrical contact with the source contact layer, said source contact regions spaced apart from each other along said body stripe and along said source stripes (column 2, lines 10-20, teaches contact regions are separated by P+ regions).

In regards to claim 2, Figure 1a of Bhalla discloses a source contact region 40 extends from the body stripe 33 in opposite directions to each source stripe.

In regards to claim 15, Figure 1a of Bhalla discloses the edges of the source stripes 20 adjacent the body stripe 33 are electrically isolated from contact with the source contact layer.

In regards to claim 17, Figure 1a of Bhalla discloses the doping concentration in the source stripes is less than the doping concentration in the source contact regions.

In regards to claim 18, Figure 1a of Bhalla discloses the first dopant is p-type and the second dopant is n-type.

In regards to claim 20, Figure 1a of Bhalla discloses a substrate 8 heavily doped with a first dopant of one polarity; a drift 12 layer doped with a second dopant of a polarity opposite to the first dopant, the drift layer located over the substrate, with the drift layer extending to a surface opposite the substrate; a base region 30 doped with the first dopant, the base region bordered by the drift layer, and the base region extending along said first surface to form a base stripe on the surface; source stripes 20 doped with second dopants in the base region for forming channel regions 36 that extend across said base stripes proximate the surface from a corresponding one of said source stripes to said drift layer in a direction away from said body stripe 33; a respective insulated control gate overlying a corresponding base and source stripe and over a corresponding channel region, each control gate including a gate stripe 16 and an insulating layer 18, said insulating layer entirely covering a corresponding one of said source strips; source contact regions 40 (column 2, line 10 teaches more than one contact region) disposed adjacent the source stripes, said source contact regions spaced apart from each other along said body stripe and along said source stripes (column 2, lines 10-20, teaches contact

regions are separated by P+ regions), resistances formed within the source stripes (column 4, lines 40-45) between the source contact regions, said resistances constricting the flow of electron current between the drift layer and the source contact regions.

In regards to claim 26, Figure 1a of Bhalla discloses the first dopant is p-type and the second dopant is n-type.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 4, 8, 13-16, 18-20, 23, 26, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blanchard in view of the admitted prior art.

In regards to claims 1 and 20, Figures 1, 4, and 9 of Blanchard disclose buffer 39 and drift 37 layers doped with a second dopant, with the drift layer extending to a first surface; a base region 23 doped with the first dopant, the base region bordered by the drift layer, and the base region extending along said first surface to form a corresponding base stripe on said first surface; first and second source stripes 61 and 63 doped with the second dopant and located in the base stripe, said source stripes being spaced apart from and substantially parallel relative to each other, said source stripes extending in a substantially parallel manner relative to the base stripe; a body stripe defined between said source stripes; first and second channel regions, each of said

channel regions extending across said base stripe from a corresponding one of said source stripes to said drift layer in a direction away from said body stripe; a respective gate oxide stripe 35 over each channel region; a respective conductive gate stripe 33 on each gate oxide stripe for controlling current through the corresponding channel; a respective insulating layer 35 over each conductive gate stripe, each insulating layer entirely covering a corresponding one of the source stripes; a source contact layer 29 extending through the insulating layer at a location between the conductive gate stripes; and a plurality of source contact regions 32 heavily doped with the second dopant, disposed in the body stripe and extending from the body stripe to at least one of the source stripes and in electrical contact with the source contact layer, said source contact regions spaced apart from each other along said body stripe and along said source stripes (see Figure). Note that it is inherent to have some resistance in the source stripes. The difference between Blanchard and the claimed invention is a substrate heavily doped with a first dopant with a first dopant of one polarity. Figure 4A of the instant application discloses a P+ substrate connected to the buffer/drift layers. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Blanchard by including a region heavily doped with first type dopants for the purpose forming a contact layer for the drain/collector, thereby making a functioning device.

In regards to claim 2, Figure 1 of Blanchard discloses a source contact region extends from the body stripe in opposite directions to each source stripe.

In regards to claims 4 and 23, Figure 9 of Blanchard discloses the source stripes are divided into a plurality of elongated source segments (1 and 97) spaced from each other along

opposite sides of the body stripe, and portions of the body region extending between opposite ends of sequential segments to separate the sequential source stripe segments from each other.

In regards to claim 8, Figure 9 of Blanchard discloses the source segments (1 and 97) are the same length.

In regards to claim 13, the product-by-process limitation "wherein the length of the source segment depends upon its proximity to a center of the IGBT die" does not structurally distinguish the claimed invention over the prior art.

In regards to claim 14, the product-by-process limitation "wherein the length of the source segment depends upon a desired local SCIS current density" does not structurally distinguish the claimed invention over the prior art.

In regards to claim 15, Figures 1 and 4 of Blanchard disclose the edges of the source stripes (61 and 63) are electrically isolated from contact with the source contact layer.

In regards to claim 16, Figures 1 and 4 of Blanchard disclose the doping concentration in the source stripes is the same as the doping concentration in the source contact regions.

In regards to claims 18 and 26, Figures 1 and 4 of Blanchard disclose the first dopant is p-type.

In regards to claims 19 and 27, Blanchard discloses the conductivity types can be reversed (column 5, lines 39-42).

Claims 35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Blanchard in view of the admitted prior art and Korman et al. (US Pat. 5,119,153, hereinafter Korman).

In regards to claim 35, Figures 1, 4, and 9 of Blanchard disclose buffer 39 and drift 37 layers doped with a second dopant, with the drift layer extending to a first surface; a base region 23 doped with the first dopant, the base region bordered by the drift layer, and the base region extending along said first surface to form a corresponding base stripe on said first surface; first and second source stripes 61 and 63 doped with the second dopant and located in the base stripe, said source stripes being spaced apart from and substantially parallel relative to each other, said source stripes extending in a substantially parallel manner relative to the base stripe; a body stripe defined between said source stripes; first and second channel regions, each of said channel regions extending across said base stripe from a corresponding one of said source stripes to said drift layer in a direction away from said body stripe; a respective gate oxide stripe 35 over each channel region; a respective conductive gate stripe 33 on each gate oxide stripe for controlling current through the corresponding channel; a respective insulating layer 35 over each conductive gate stripe, each insulating layer entirely covering a corresponding one of the source stripes; a source contact layer 29 extending through the insulating layer at a location between the conductive gate stripes; and a plurality of source contact regions 32 heavily doped with the second dopant, disposed in the body stripe and extending from the body stripe to at least one of the source stripes and in electrical contact with the source contact layer, said source contact regions spaced apart from each other along said body stripe and along said source stripes (see Figure). Note that it is inherent to have some resistance in the source stripes. The difference

between Blanchard and the claimed invention is a substrate heavily doped with a first dopant with a first dopant of one polarity. Figure 4A of the instant application discloses a P+ substrate connected to the buffer/drift layers. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Blanchard by including a region heavily doped with first type dopants for the purpose forming a contact layer for the drain/collector, thereby making a functioning device. A further difference between Blanchard and the claimed invention is more than one base region. Figure 1 of Korman discloses a plurality of base regions 118 electrically connected. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Blanchard by including more than one base region for the purpose of fabricating a high power device.

In regards to claim 37, Figure 9 of Blanchard discloses the source stripes (1 and 97) are sequentially segmented and sequential segments are separated from each other by the base region.

Claims 5, 22, 35, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bhalla in view of Korman.

In regards to claim 35, Figure 1 of Bhalla discloses a substrate 8 heavily doped with a first dopant of one polarity; a drift 12 layer doped with a second dopant of a polarity opposite to the first dopant, the drift layer located over the substrate, with the drift layer extending to a surface opposite the substrate; a base region 30 doped with the first dopant, the base region

bordered by the drift layer, and the base region extending along said first surface to form a base stripe on the surface; two source stripe regions 20 doped with second dopants in the base region for forming channel regions 36 that extend across said base stripes proximate the surface from a corresponding one of said source stripes to said drift layer in a direction away from said body stripe 33; a respective insulated control gate overlying a corresponding base and source stripe and over a corresponding channel region, each control gate including a gate stripe 16 and an insulating layer 18, said insulating layer entirely covering a corresponding one of said source strips; source contact regions 40 (column 2, line 10 teaches more than one contact region) disposed adjacent the source stripes, said source contact regions spaced apart from each other along said body stripe and along said source stripes (column 2, lines 10-20, teaches contact regions are separated by P+ regions), resistances formed within the source stripes (column 4, lines 40-45) between the source contact regions. The difference between Bhalla and the claimed invention is more than one base region. Figure 1 of Korman discloses a plurality of base regions 118 electrically connected. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Bhalla by including more than one base region for the purpose of fabricating a high power device.

In regards to claims 5, 22, and 38, the difference between Bhalla and the claimed invention is a plurality of base stripes connected to form a common base. Figure 1 of Korman discloses a plurality of base stripes 118 electrically connected. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Bhalla by including a plurality of electrically connected base stripes. The

ordinary artisan would have been motivated to modify Bhalla in the manner described above for the purpose of fabricating a high power device.

Claims 28, 29, 30, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable admitted prior art.

In regards to claims 28 and 30, Figure 4B of the instant application discloses an insulated gate bipolar transistor device (IGBT) comprising: a substrate 9 heavily doped with a first dopant of one polarity; a drift layer 5 over the substrate and doped with a second dopant of an opposite polarity, the drift layer defining a surface opposite the substrate; a trench gate 19 in said surface including a gate insulator 17 disposed between the trench gate and said surface, and a conductive material 19 adjacent the gate insulator forming a gate electrode; base regions 3 disposed on opposite sides of said gate trench and being doped with the first dopant, each base region bordered by the drift layer and extending along a length of the surface to form base stripes on the surface; source stripe (2a and 2b) disposed between the base stripes and the trench and shallower than the base for forming channel regions along the opposite sides of the trench; and a source contact region (area contacted by layer 23) extending between the base regions and the source stripes. It is inherent that some resistance exists in the source stripes and disposed between the source contact regions. The difference between the admitted prior art shown in Figure 4B of the instant application and the claimed invention is having more than one source contact region with the source contact regions being spaced apart relative to each other and along the base and source stripes. Figures 4D, 5, and 6 of the instant application show the aforementioned configuration. In view of such teaching, it would have been obvious to the ordinary artisan at the time the

invention was made to modify the invention of the admitted prior art by incorporated the teaching of a plurality of separate source contact regions shown in Figures 4D, 5, and 6 for the purpose of increasing the capacity and improving performance of the device.

In regards to claim 29, Figure 4B of the instant application discloses a insulating layer 21 over the trench gate 19 and over source stripe regions (2a and 2b); a plurality of vias in the insulating layer and over the source contact regions; a source contact layer 23 over the insulating layer and extending through the vias therein to contact the source contact regions in the source stripes.

In regards to claim 31, Figure 4B of the instant application discloses the base regions 3 are connected together to form a common base.

Allowable Subject Matter

Claims 10, 12, 25, 32, and 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (703) 305-4396.

The examiner can normally be reached from 8:00 AM-4: 30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Matthew C. Landau

Examiner

July 23, 2003